In conclusion, giant polar bodies do not develop because they are not fertilized and they are not fertilized because they are generally formed after a spermatozoon has entered the egg and has rendered it impervious to other spermatozoa.

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RADIAL VELOCITIES OF THE PLANETARY AND IRREGULAR NEBULAE

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In a former number of the PROCEEDINGS[1] one of the authors presented results on the radial velocities of 54 gaseous nebulae determined by spectrographic methods at the Lick and D. O. Mills Observatories, working respectively in the northern and southern skies. It was there shown that the planetary nebulae, or those of regular form, are rapid travelers in comparison with the stars, a fact which casts serious doubts upon the generally accepted hypothesis that the stars have been formed from planetary nebulae by processes of evolution.

During the past year observations at both institutions have been extended to fainter members of this class of objects, and there are now available some 348 measures of the velocities of approach and recession of 92 gaseous nebulae, or those whose spectra are composed of bright lines.

Before proceeding to a discussion of the results, those for 12 nebulae situated in the Magellanic Clouds are set aside for special consideration, since, as will be shown later, they are attended by conditions which are not representative of nebulae in other portions of the sky. There remain 80 observed objects, of which 7 are extended or irregular in form, and 73 have the forms characteristic of planetary and ring nebulae. When all the observed velocities have been freed from the effects of the solar motion, the average velocities of approach and recession of the various groups are found to be:

Of 7 extended nebulae	10 km./sec.
Of 73 planetaries or regular form	39 km./sec.
Of 34 'stellar' (less than 5″ diameter)	50 km./sec.
Of 39 non-stellar (disks and rings)	29 km./sec.

The velocities of the few extended nebulae thus far observed are low and of the order of the average velocity of stars of Class B, a result which is not surprising in view of the intimate relationship known to exist between these two classes of objects. The average velocity of the 73 planetaries is, on the other hand, more than six times that of the Class B stars. That planetary nebulae will eventually become helium stars can scarcely be questioned, but the old hypothesis that helium stars have in general evolved from planetary nebulae hardly appears tenable.

A division of the 73 planetaries into two groups according to their apparent size brings out a further relation of great interest The 34 nebulae which are described in the catalogues as 'stellar,' or those whose apparent diameter is less than 5″, are found to be traveling almost twice as fast as the 39 nebulae of greater apparent diameter whose forms are those of hazy disks or of concentric or superimposed rings. If these stellar nebulae are small objects their higher velocities may be in harmony with recent indications concerning stellar motions to the effect that the stars of small mass are traveling more rapidly than those of great mass. On the other hand, if they appear smaller on account of their greater distance, an analogy is suggested to the recent results obtained by Adams, that the more distant stars of certain spectral classes are traveling more rapidly than those which are nearer to us.

Attention was called in the earlier paper to the fact that the nebular velocities are distributed with more or less equal frequency for speeds of all observed magnitudes, a circumstance in marked contrast with the helium stars, whose peculiar motions follow pretty closely the 'probability curve.' Similar conclusions even more strongly marked may be drawn for the distribution of the velocities of the 34 stellar nebulae.

For an assumed apex of the sun's way at Right Ascension 270° and Declination +30°, the 73 planetaries give a solar velocity of 2.01 km./sec., while the 7 extended nebulae give 20.7 km./sec. These values are in remarkable accordance with that derived from 225 Class B stars, namely, 20.2 km./sec.

When the results for the 73 planetary nebulae are examined for the existence of preferential motions, in accordance with Kapteyn's two star-stream hypothesis, it is found that they show a marked preference for motions making small angles with the line joining Kapteyn's two vertices. A similar indication is shown when the velocities of these nebulae are grouped with reference to their distances from the central line of the Milky Way, a conclusion which is entitled to less weight, since only 10 of these objects are situated more than 20° from the galactic plane.

The fact that the gaseous nebulae have motions which are characteristic of the stars, as shown by the value of the solar motion derived from them, and by their exhibiting the phenomena of star streaming, taken together with their strong concentration in the Milky Way, affords a reliable basis for the view, frequently expressed, that these nebulae are members of our stellar system.

Since the announcement[2] by Dr. Wilson of the high velocities of 5 nebulae in the Magellanic Clouds, 7 more of these objects have been observed. The only known nebula in the Lesser Cloud has a velocity of recession of 149 km./sec., while 11 nebulae observed in the Greater Cloud have velocities of recession ranging between +237 and +287 km./sec.

In as much as gaseous nebulae are unknown in the surrounding regions of the sky, it is a fair assumption that all of these bright-line objects are within the structure of the two Clouds. It is therefore probable that the velocity of the Greater Cloud with reference to the stellar system is approximately the average velocity of the 11 nebulae observed within it, or 262 km./sec. recession. The observed velocity for only one object in the Lesser Cloud is hardly sufficient to justify an analogous hypothesis for it. However, the similarity in the appearance of the two clouds and their proximity to each other lead to the suspicion that a more or less intimate relationship may exist between them. Furthermore, the high galactic latitudes of these objects, coupled with their high velocities with reference to the centroid of stars, lends some support to the hypothesis that the Magellanic Clouds are isolated cosmic units, systems which have no apparent connection with our own stellar system.

[1] These PROCEEDINGS, **1**, 8 (1915).
[2] *Ibid.*, **1**, 183 (1915).